

• • R E M A R K S / A R G U M E N T S • •

The Official Action of May 21, 2004 has been thoroughly studied. Accordingly, the changes presented herein for the application, considered together with the following remarks, are believed to be sufficient to place the application into condition for allowance.

As requested by the Examiner on page 2 of the Official Action, applicant is submitting wherewith a Substitute Specification under 37 CFR §1.125 (a) together with a hand-marked-up copy of the original specification showing the changes made to the original specification.

The undersigned affirms that the Substitute Specification only contains the changes noted in the hand-marked-up copy of the original specification and does not contain any new matter.

Entry of the Substitute Specification is respectfully requested.

Also by the present Amendment the Abstract has been changed.

In addition, the claims have been changed in the manner courteously suggested by the Examiner.

Entry of the Substitute Specification, amendments to the Abstract and amendments to the claims are respectfully requested.

Claims 1-3 are pending in this application.

Appl. No. 10/627,267
Amdt. Dated September 21, 2004
Reply to Office Action of May 21, 2004

Claims 1 and 2 stand provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over co-pending application serial no. 10/627,267.

Claim 3 stands provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over co-pending application serial no. 10/627,267 in view of JP 2-180941.

In response to the provisional obviousness-type double patenting rejections, the undersigned notes that applicant will be filing a Terminal Disclaimer to overcome this rejection in due course and the Examiner is requested to hold this provisional rejection in abeyance until an executed Terminal Disclaimer can be obtained and submitted. (This case was recently transferred to the undersigned, who does not have a power of attorney to sign a Terminal Disclaimer for the applicant)

It is believed that the above represents a complete response to the Official Action and reconsideration is requested.

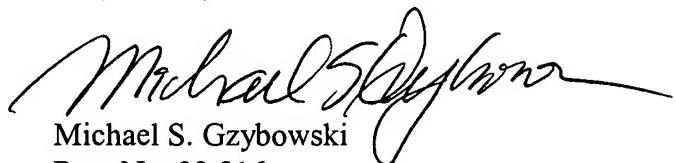
The prior art cited but not relied upon by the Examiner has been noted. This prior art is not believed to be particularly pertinent to applicants' claimed invention.

If upon consideration of the above, the Examiner should feel that there remain outstanding issues in the present application that could be resolved; the Examiner is invited to contact applicants' patent counsel at the telephone number given below to discuss such issues.

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To the extent necessary, a petition for an extension of time under 37 CFR §1.136 is hereby made. Please charge the fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account No. 12-2136 and please credit any excess fees to such deposit account.

Respectfully submitted,



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11775.1



SPECIFICATION

RESIN COMPOSITION FOR PURGING CONTAMINANT IN THE PLASTIC PROCESSING MACHINE

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a resin composition for purging ~~contaminant~~ contaminant in ~~the~~ plastic processing machine.

2. Description of the Related Art

Plastics have excellent properties such as easy processability, high productivity, light weight and relative low procuring costs, so they are used for the parts and structural materials for automobile, autobicycle, scooter, television, radio, audio equipment, washing machine, rice cooker, personal computer, portable telephone, game machinery, building materials, office supplies, stationery, toys, sports goods, sports equipment, agricultural tools and marine tools.

They are usually prepared by plastic processing methods such as injection molding, blow molding, compression molding, transfer molding, rotating molding, slush molding, inflation tubular film process, and extrusion molding.

As plastics processing are conducted at high temperatures above 200°C, additives, monomers, decomposed materials in the plastics are changed to carbonized materials such as tar, pitch and other color colored

ured sticky substances, which are apt to adhere to the surface of the screw, barrel and die of the plastic processing machine to cause transfer of the carbonized materials to the molded product. The above mentioned transfer makes the surfaces of molded products dirty and makes the dimensions of the molded product inaccurate, resulting in failure to perform expected moving or structural functions, therefore cleaning the screw, barrel and die of the plastic processing machine has been required.

In case of production change from specific colored articles to non-colored specific coloured molded article to non-colored or other colored molded article, articles, cleaning the screw, barrel and die has been also required to avoid crosscontamination caused by remained specifically colored resin compound. compound residue with

However, there are some problems on the conventional cleaning method of the screw, barrel and die.

One conventional cleaning method has been known as the method of dismantling the plastic processing machine, resulting in exposing the screw, barrel and die to the outside, then the carbonized material or colored materials adhered to the surface of the screw, barrel and die are removed by using the separating tools such as knife.

However, this method has a defect of exposing operators to high temperature and taking long times, which causes some operators suffering of skin burn to operators to suffer burns.

or electric shock. sized processing

In the case of large size plastic processing machines, dismantling is impossible.

There are known other conventional cleaning methods in which uncoloured thermoplastic resin such as low density polyethylene is passed through the inside of the plastic processing machine. Such methods cannot remove contaminants entirely even if used over extended times. Moreover, such methods generate a large amount of mixed product consisting of contaminants and resin, which scarcely find use as the recycling resin compound.

Another cleaning method involves the use of a method of using the resin composition containing calcium carbonate which exerts improved effect on the removal of coloured contaminants. However, it causes new problem of remaining the inorganic power in the plastic processing machine.

Another cleaning method also has been attempted by using resin composition consisting of a thermoplastic resin such as low density polyethylene and a surface active agent such as sodium stearate or polyoxyethylene nonylphenyl ether having the effect of lowering interface tension. However, the coloured contaminants were scarcely removed.

Based on the above mentioned knowledge, new cleaning methods have been disclosed in the Japanese Kokai Patents (H2-180941 and H7-53774), in which it is disclosed

C C

uncolored
a resin composition consisting of ~~uncolored~~
~~thermoplastic~~ resin and a calcium
salt of ^{an} organic boron compound having δ
SP₃ hybridization orbitals. ^{This} resin composition
which maintains a certain ~~extent~~ amount
of abrasive property. ~~Properties~~ ^{does}

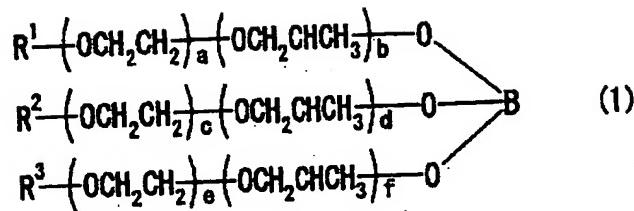
However, the method is ~~still~~ not ~~excess~~ except
its ^a sufficient effect of removing the
~~coloured contaminant~~ ^{colored contaminants}

SUMMARY OF THE INVENTION

As a result of diligent investigation ^{during the course of}
~~by~~ the present invention, ~~under such sit-~~
~~uation,~~ the present invention provides a ~~contaminates~~
resin composition for purging away ~~cont-~~ machines
~~aminant in the plastic processing machi-~~
~~which resin composition comprises~~ ^{polyoxyalkylene}
~~be comprising~~ a thermoplastic resin and
a specific borate ester of ~~polyoxyalky~~
~~ene~~ ^{purgung contaminants} ~~and a purging method of~~ ^{contamina-}
~~the present invention further provides~~ ^{machines which}
~~at in the plastic processing machine~~ ^{involves}
~~by passing said resin composition throu-~~
~~gh inside of the plastic processing ma-~~
~~chine machines~~

DETAILED DESCRIPTION OF THE INVENTION

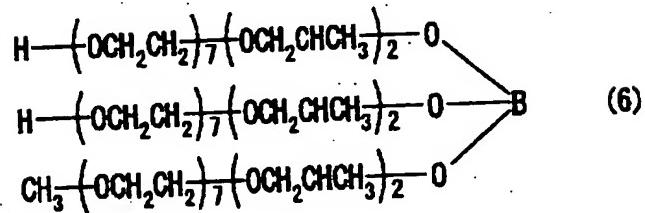
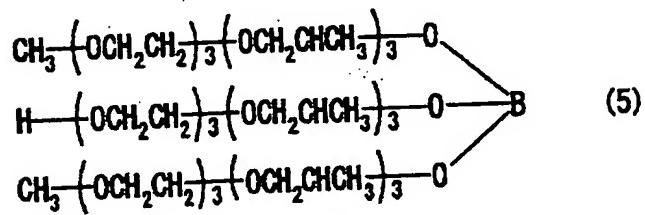
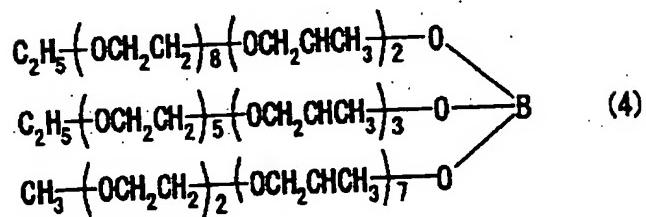
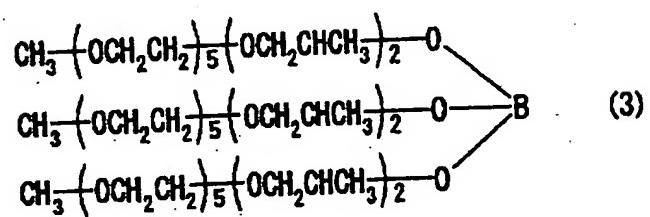
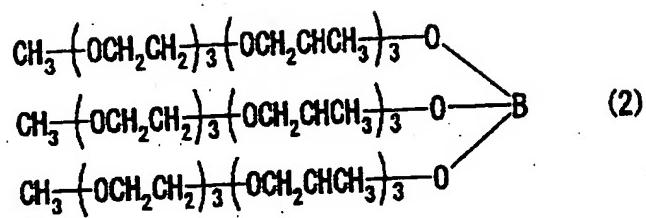
The ^{chemical}
A borate ester of polyoxyalkylene used for the present invention is a ~~che-~~
~~mical~~ compound expressed by the follow-
ing general formula (1). ^{following}

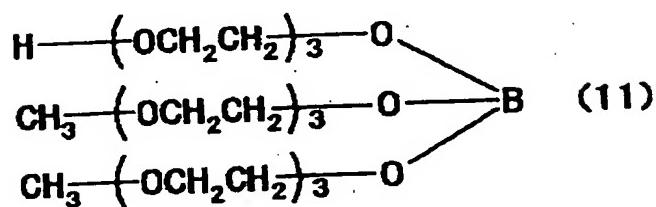
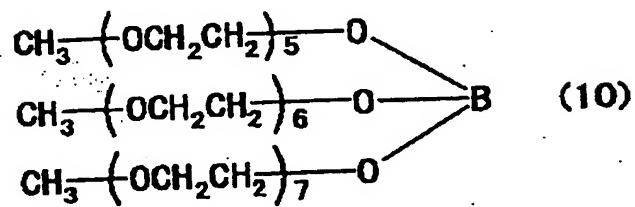
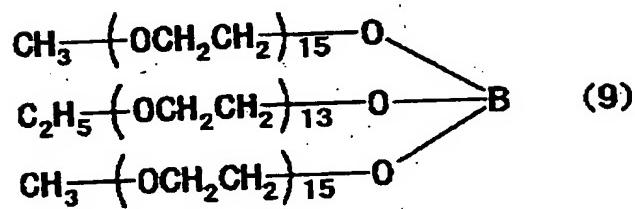
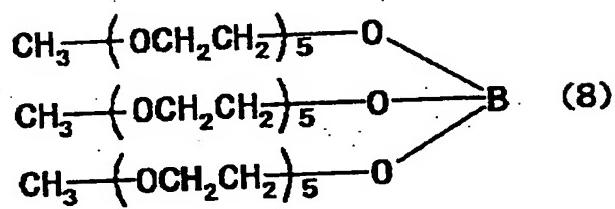
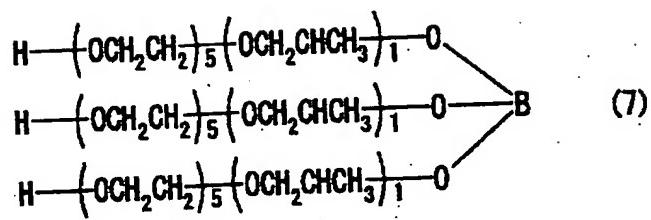


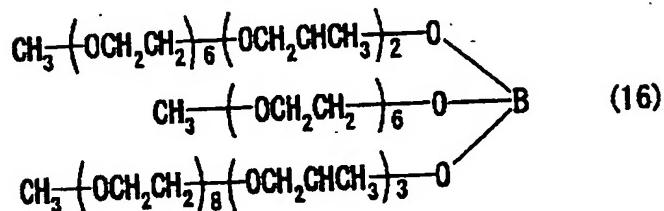
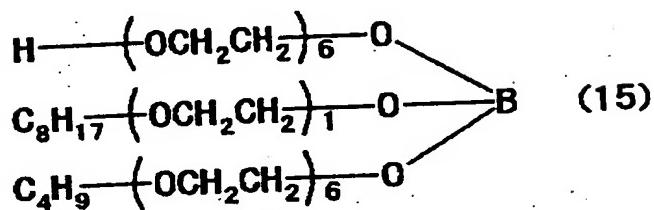
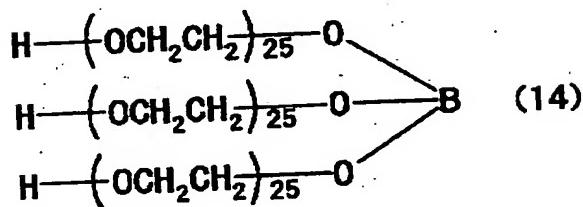
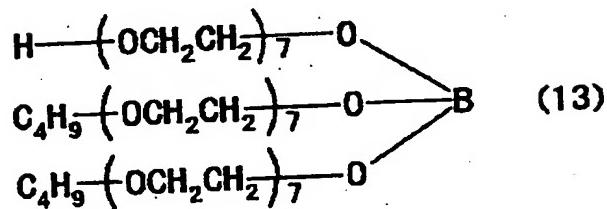
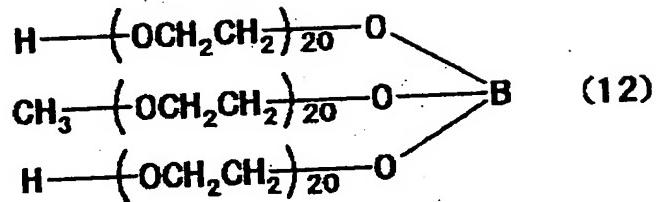
wherein R^1 , R^2 and R^3 are independently selected from the group consisting of hydrogen and hydrocarbon groups, a , b , c , d , e and f are positive integers independently selected from 0 to 30 whose sum is from 6 to 80.

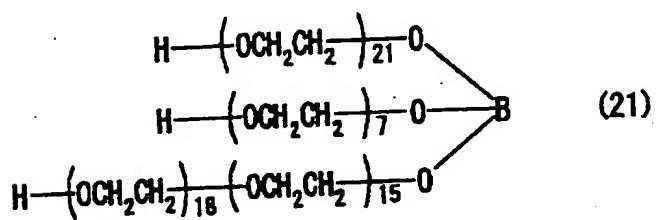
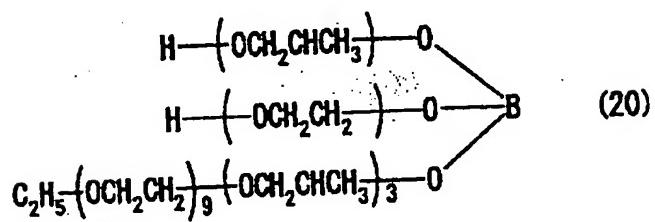
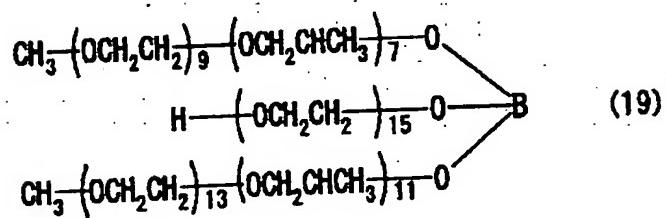
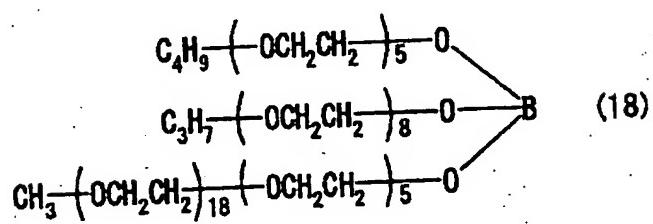
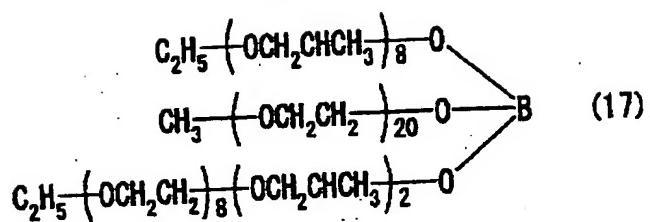
Examples of the hydrocarbon group are alkyl groups such as methyl, ethyl, propyl, isopropyl, butyl, pentyl, hexyl, octyl, nonyl, decyl, dodecyl, hexadecyl, octadecyl and docosyl groups and phenyl, tolyl and cyclohexyl groups.

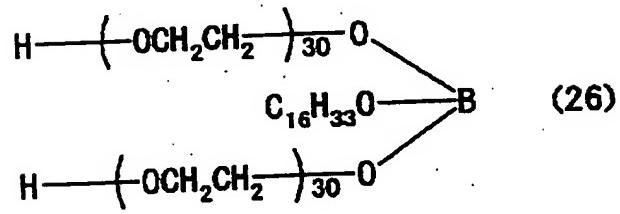
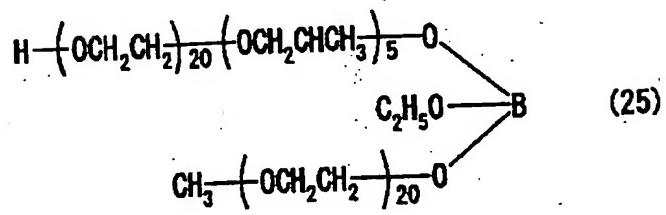
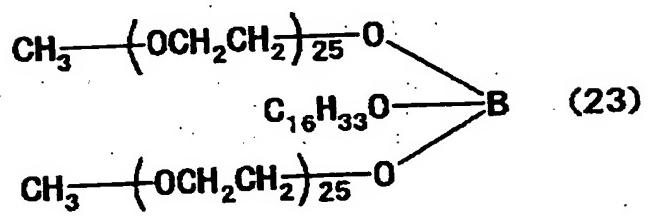
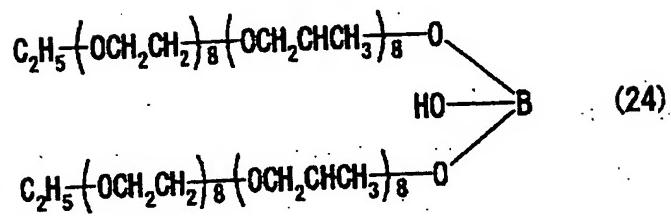
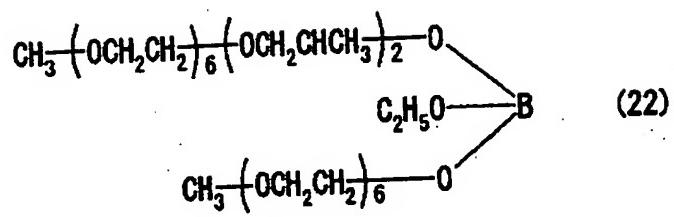
Illustrative of the borate ester of polyoxyalkylene are the chemical compound expressed by the following chemical formula from (2) to (27).

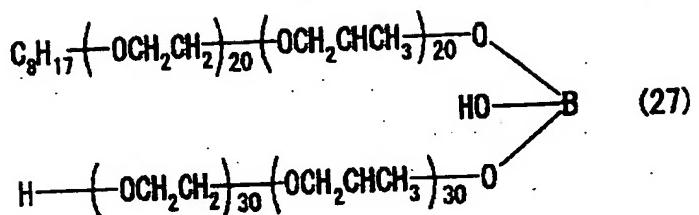












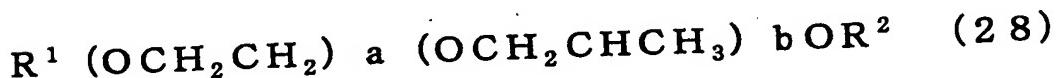
Production method for the borate esters of polyoxyalkylene used for the present invention are not limited to any specific method; however, the following method is preferable.

The borate esters of polyoxyalkylene are produced by esterification-dehydration condensing reaction by contacting polyoxyalkylene expressed by the chemical formula (28) with boric acid or borate esters of lower alcohol such as methyl alcohol or ethyl alcohol.

It is preferable that the reaction is carried out by using 1 mol of boric acid or borate esters of lower alcohol with from 3 to 3.5 moles of polyoxyalkylene expressed by the chemical formula (28).

If the mole ratio is less than 3, it is not preferable because undesirable byproducts of borate esters having two or three boron atoms are generated.

The other byproducts or unreacted polyoxyalkylene may be remained in the borate esters unless they do not hinder the purging effect of the resin composition of the present invention.



selected

wherein R¹ and R² are independently selected from the group consisting of hydrogen and hydrocarbon group, ^{hydrogen}_a and b are independently selected from 0 to 30.

Examples of the hydrocarbon group are alkyl groups such as methyl, ethyl, propyl, isopropyl, butyl, pentyl, hexyl, octyl, nonyl, decyl, dodecyl, hexadecyl, octadecyl and docosyl groups and phenyl, tolyl and cyclohexyl group.

Examples of the polyoxalkylene expressed by the chemical formula (28) are as follows:

diethylene glycol monomethyl ether,
diethylene glycol monoethyl ether,
diethylene glycol monoisopropyl ether,
diethylene glycol monobutyl ether,
diethylene glycol monoocethyl ether,
diethylene glycol monodecyl ether,
diethylene glycol monohexadecyl ether,
diethylene glycol monooctadecyl ether,

triethylene glycol monomethyl ether,
triethylene glycol monoethyl ether,
triethylene glycol monoisopropyl ether,
triethylene glycol monobutyl ether,
triethylene glycol monoocethyl ether,
triethylene glycol monodecyl ether,
triethylene glycol monohexadecyl ether,
triethylene glycol monoocadecyl ether,

tetraethylene glycol monomethyl ether,
tetraethylene glycol monoethyl ether,
tetraethylene glycol monoisopropyl ether,
tetraethylene glycol monobutyl ether,

tetraethylene glycol monooctyl ether,
tetraethylene glycol monodecyl ether,
tetraethylene glycol monohexadecyl ether,
tetraethylene glycol monooctadecyl ether,

polyethylene glycol monomethyl ether,
polyethylene glycol monoethyl ether,
polyethylene glycol monoisopropyl ether,
polyethylene glycol monobutyl ether,
polyethylene glycol monooctyl ether,
polyethylene glycol monodecyl ether,
polyethylene glycol monohexadecyl ether,
polyethylene glycol monoctadecyl ether,

dipropylene glycol monomethyl ether,
dipropylene glycol monoethyl ether,
dipropylene glycol monoisopropyl ether,
dipropylene glycol monobutyl ether,
dipropylene glycol monooctyl ether,
dipropylene glycol monodecyl ether,
dipropylene glycol monohexadecyl ether,
dipropylene glycol monoctadecyl ether,

tripropylene glycol monomethyl ether,
tripropylene glycol monoethyl ether,
tripropylene glycol monoisopropyl ether,
tripropylene glycol monobutyl ether,
tripropylene glycol monooctyl ether,
tripropylene glycol monodecyl ether,
tripropylene glycol monohexadecyl ether,
tripropylene glycol monoctadecyl ether,

tetrapropylene glycol monomethyl ether,
tetrapropylene glycol monoethyl ether,
tetrapropylene glycol monoisopropyl
ether,

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tetrapropylene glycol monobutyl ether,
tetrapropylene glycol monoocethyl ether,
tetrapropylene glycol monodecyl ether,
tetrapropylene glycol monohexadecyl
ether,
tetrapropylene glycol monooctadecyl
ether,

polypropylene glycol monomethyl ether,
polypropylene glycol monoethyl ether,
polypropylene glycol monoisopropyl ether,
polypropylene glycol monobutyl ether,
polypropylene glycol monoocethyl ether,
polypropylene glycol monodecyl ether,
polypropylene glycol monohexadecyl ether,
polypropylene glycol monoococtadecyl ether,

diethyleneglycol tripropyleneglycol
monomethyl ether,
tetraethyleneglycol dipropyleneglycol
monomethyl ether,
tetraethyleneglycol tripropyleneglycol
monomethyl ether,
tetraethyleneglycol tetrapropyleneglycol
monomethyl ether,
pentaethyleneglycol dipropyleneglycol
monomethyl ether,
pentaethyleneglycol tripropyleneglycol
monomethyl ether,
diethyleneglycol tetrapropyleneglycol
monomethyl ether,

hexaethyleneglycol dipropyleneglycol
monomethyl ether,
hexaethyleneglycol dipropyleneglycol
monomethyl ether,

hexaethyleneglycol tripropylene glycol
monomethyl ether,
hexaethyleneglycol tetrapropylene glycol
monomethyl ether,
hexaethyleneglycol pentapropylene glycol
monomethyl ether,
hexaethyleneglycol hexapropylene glycol
monomethyl ether,

heptaethyleneglycol dipropylene glycol
monomethyl ether,
heptaethyleneglycol dipropylene glycol
monomethyl ether,
heptaethyleneglycol tripropylene glycol
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monomethyl ether,
octaethyleneglycol tetrapropylene glycol
monomethyl ether,
octaethyleneglycol pentapropylene glycol
monomethyl ether,
octaethyleneglycol hexapropylene glycol
monomethyl ether,
octaethyleneglycol heptapropylene glycol
monomethyl ether,

polyethyleneglycol polypropyleneglycol
monomethyl ether,

triethylene glycol,
tetraethylene glycol,
pentaethylene glycol,
hexaethylene glycol,
heptaethylene glycol,
octaethylene glycol,
decaethylene glycol,
tridecaethylene glycol,
hexadecaethylene glycol,
eicosaethylene glycol,
pentacosaeethylene glycol,
triacosaeethylene glycol,

tripropylene glycol,
tetrapropylene glycol,
pentapropylene glycol,
hexapropylene glycol,
heptapropylene glycol,
octapropylene glycol,
decapropylene glycol,
tridecapropylene glycol,
hexadecapropylene glycol,
eicosapropylene glycol,
pentacosapropylene glycol,
triacosapropylene glycol,

triethylene glycol tripolypropylene glycol,
tetraethylene glycol dipropylene glycol,
tetraethylene glycol tripolypropylene glycol,
tetraethylene glycol tetrapropylene glycol,
pentaethylene glycol dipropylene glycol,
pentaethylene glycol tripolypropylene glycol,

hexaethylene glycol dipropylene glycol,
hexaethylene glycol tripropylene glycol,
hexaethylene glycol pentapropylene
glycol,
hexaethylene glycol hexapropylene glycol,
heptaethylene glycol dipropylene glycol,
triacosaethylene glycol dipropylene
glycol,

heptaethylene glycol tripropylene glycol,
heptaethylene glycol tetrapropylene
glycol,
heptaethylene glycol pentapropylene
glycol,
heptaethylene glycol hexapropylene
glycol,
heptaethylene glycol heptapropylene
glycol,

octaethylene glycol dipropylene glycol,
octaethylene glycol tripropylene glycol,
octaethylene glycol tetrapropylene
glycol,
octaethylene glycol pentapropylene
glycol,
octaethylene glycol hexapropylene glycol,
octaethylene glycol pentapropylene
glycol,
octaethylene glycol octapropylene glycol,
polyethylene glycol polypropylene glycol,

tripropylene glycol triethylene glycol
monomethyl ether,
tetrapropylene glycol diethylene glycol
monomethyl ether,
tetrapropylene glycol triethylene glycol

monomethyl ether,
tetrapropylene glycol tetraethylene glycol monomethyl ether,
pentapropylene glycol diethylene glycol monomethyl ether,
pentapropylene glycol triethylene glycol monomethyl ether,
pentapropylene glycol tetraethylene glycol monomethyl ether,

hexapropylene glycol diethylene glycol monomethyl ether,
hexapropylene glycol triethylene glycol monomethyl ether,
hexapropylene glycol tetraethylene glycol monomethyl ether,
hexapropylene glycol pentaethylene glycol monomethyl ether,
hexapropylene glycol hexaethylene glycol monomethyl ether,

heptapropylene glycol diethylene glycol monomethyl ether,
heptapropylene glycol triethylene glycol monomethyl ether,
heptapropylene glycol tetraethylene glycol monomethyl ether,
heptapropylene glycol pentaethylene glycol monomethyl ether,
heptapropylene glycol hexaethylene glycol monomethyl ether,
heptapropylene glycol heptaethylene glycol monomethyl ether

octapropylene glycol diethylene glycol monomethyl ether,

octapropylene glycol triethylene glycol monomethyl ether,

octapropylene glycol tetraethylene glycol monomethyl ether,

octapropylene glycol pentaethylene glycol monomethyl ether,

octapropylene glycol hexaethylene glycol monomethyl ether,

octapropylene glycol heptaethylene glycol monomethyl ether

octapropylene glycol octaethylene glycol monomethyl ether

polypropylene glycol polyethylene glycol monomethyl ether

tripropylene glycol triethylene glycol monomethyl ether,

tetrapropylene glycol triethylene glycol monomethyl ether,

tripropylene glycol triethylene glycol monomethyl ether,

octapropylene glycol diethylene glycol monomethyl ether,

octaethylene glycol dipropylene glycol monomethyl ether,

octaethylene glycol tripropylene glycol monomethyl ether,

octaethylene glycol tetrapropylene glycol monomethyl ether,

octaethylene glycol pentapropylene glycol monomethyl ether,

octaethylene glycol hexapropylene glycol monomethyl ether,

octaethylene glycol heptapropylene glycol monomethyl ether,

octaethylene glycol octapropylene glycol monomethyl ether,

polyethylene glycol polypropylene glycol monomethyl ether.

A solvent or diluent may be incorporated into the raw materials such as boric acid, borate ester of lower alcohol and polyoxalkylene, or into borate esters of glycol ether.

If the solvent or diluent are employed, they must not disturb the esterification-dehydration or ester-exchange reaction and their boiling point should be below the boiling point of the byproducts or polyoxalkylenes.

Examples of the solvents or diluents are ethers such as diethyl ether, dioxane, tetrahydrofuran; aliphatic hydrocarbons such as hexane, acetic anhydride, heptane, octane, nonane, decane, undecane; aromatic hydrocarbons such as benzene, toluene, xylene; cycloalkanes such as cyclohexane, cyclohexene; non-proton polar compounds such as dimethyl formamide, dimethyl sulfoxide, hexamethyl polyamide phosphate, acetonitrile, N-methyl pyrro-pyrrolidone; and their chlorine substituted compounds such as chloroform and carbon tetrachloride.

A catalyst for the esterification-dehydration or ester-exchange reaction may be used.

If the catalysts are necessary for promoting the reaction, following condensation catalysts are recommended.

Example of the catalysts are metallic Examples

Salts acids octanoate
salt of organic acid such as ferrous ~~or~~
~~tanate~~, ferrous naphthenate, cobaltous
naphthenate, manganese octanoate, ~~stannum~~ ~~Stannum~~
~~um~~ octanoate, stannum naphthenate, lead
octanoate, lead naphthenate, organotin
~~compounds~~ such as dibutyl tin diacetate,
~~dibutyl~~ ~~dibutyl~~ tin dioctanoate, dibutyl tin
dilaurate, ~~dibutyl~~ ~~dibutyl~~ tin dioleate, dibutyl
tin dimethoxide, oxidized dibutyl tin;
metal ~~alcoholates~~ such as tetrabutyl
titamate, tetrabutyl zirconate; titanium
~~titanium chelates~~ such as di-isopropoxy bis-acetyl
acetone titanium, 1, 3-propanedioxy
bis-ethylacetone titanium, 1, ~~3~~-³-propanedioxy
nedioxy bis-ethylacetone titanium.
~~aluminum chelates~~ such as aluminum acetylacetate
~~aluminum chelates~~ such as aluminum acetylacetate
acetone, ~~aluminum~~ tris-ethylacetone acetone
acetone; amines such as hexyl amine, dodecyl
amino phosphate, dimethyl hydroxyamine,
diethyl hydroxyamine; tetra-ammonium ~~inorganic~~
~~salt~~ such as benzyl hydroxyamine; inorganic
acid such as hydrochloric acid,
nitric acid, sulfuric acid, phosphoric anhydride
acid; organic acid such as acetic anhydride,
pure acetic acid (over 99.8%), propionic
acid, citric acid, benzoic acid,
formic acid, acetic acid, oxalic acid,
p-toluenesulfonic acid; chlorosilane chlorosilanes
such as methyl tri-chlorosilane, dimethyl
di-chlorosilane; inorganic base such
as aqueous ammonia; organic base such as
ethylene diamine, tri-ethanol amine; and
amino alkylamine.

dimethyl esterification-dehydration
It is preferable that the esterification-
ion-dehydration or ester-exchange reac-
tion is carried out under ~~the~~ conditions

C G

pressures and at a temperature
of at reduced or atmospheric pressure, and preferably
from 50 to 250°C, temperature, favourably
from 100 to 180°C.

Under the reaction, removal of byproducts
such as lower alcohol or water can
proceed the reaction easily because removal
of byproducts proceed the reaction
equilibrium to favorable direction of
formation of borate ester of polyoxyalkylenes.

As to the removal method, azeotropic
distillation using an azeotropic agent and
batch or continuous distillation using
a distillation tower are preferable.

For the purpose of improving the properties
of the borate ester of polyoxyalkylenes, amino group containing compound
and/or solvent may be added to said borate
esters of polyoxyalkylenes.

Adding the amino group containing compound
to the borate ester of polyoxyalkylenes
exhibits the suppressing of borate
ester hydrolysis and also exhibits
a rust preventive effect under the condition
of the presence of water or its vapor.

Examples of the amino-group containing compound
include alkylamine, cycloalkylamine,
amine, alkanol amine, heterocyclic amine,
diamine, lactam, cyclic imide and poly-amine,
which may be used alone or combination
selecting from these compound.

As the alkyl amine, there can be used
methyl amine, dimethyl amine, trimethyl
amine, ethyl amine, diethyl amine, tri-
ethyl amine, propyl amine, N, N-di[poly(4)-
oxyethyl] hexadecyl amine, dodecyl dime-

thyl amine, stearamide propyl dimethyl
amine, polyoxyethylene (3-30) octadecyl
amine, polyoxyethylene (3-30) lauryl amine,
polyoxyethylene (3-30) oleyl amine, polyoxyethylene
yethylene (3-30) dilauryl amine, polyoxyethylene
hylene (3-30) stearyl amine, polyoxyethylene (3-30)
ene (3-30) alkyl amine, polyoxyethylene (3-30)
dialkyl amine, and di(oleoyloxyethyl)
hydroxy amine.

As the cycloalkyl amine, there can be
used cyclohexyl amine, methyl cyclohexyl
amine and ethyl cyclohexyl amine.

As the alkanol amine, there can be used
ethanol amine, diethyl hydroxy methyl
amine, diethanol amine, dimethyl amino
ethanol, triethanol amine, propanolamine,
dimethyl 2-hydroxypropyl amine, butanol
amine, methyldi(2-hydroxyethyl) amine,
tri(2-hydroxyethyl) amine, hydroxymethyl
di(2-hydroxyethyl) amine, dibenzil 2-hydroxypropyl
2-hydroxypropyl amine and cyclohexyl di(2-hydroxyethyl
2-hydroxyethyl) amine.

As the cycloalkanol amine, there can
be used cyclohexanol amine, methylcyclo
hexanol amine and ethylcyclohexanol
amine.

As the heterocyclic amine, there can
be used pyridine, lutidine, 3, 4-
xylidine, piperidine, N-methyl piperidine
and N-ethyl piperidine.

As the lactam, there can be used
propio lactam, N-methylpropio lactam, N-
ethyl butyro lactam, N-methyl varero
lactam, N-methyl caprolactam and phenyl
caprolactam.

As the cyclic imide, there can be used

succinimide, N-methyl succinimide, N-ethyl succinimide, phenyl succinimide and 2-undecyl imidazoline.

As the diamine, there can be used ethylene diamine, triethylene diamine and tetraethylene diamine.

As the polyamine, there can be used diethylene triamine, triethylene tetraamine and pentaethylene pentamine.

Among these ~~aminogroup~~ containing compounds, tertiary ~~aminogroup~~ containing compound exhibit excellent effect of preventing hydrolysis of borate ester of polyoxyalkylene and promoting the cleaning and purging the coloured contamination.

Examples

Example of tertiary ~~aminogroup~~ containing compounds having the above mentioned excellent properties are polyoxyethylene (3-30) octadecyl amine, polyoxyethylene (3-30) lauryl amine, polyoxyethylene (3-30) oleyl amine, polyoxyethylene (3-30) stearyl amine, polyoxyethylene (3-30) alkyl amine, polyoxyethylene (3-30) dialkyl amine and di(oleoyloxyethyl) hydroxy amine.

The amount of ~~aminogroup~~ containing borate compound to 100 parts by weight of borate ester of polyoxyalkylene is from 0 to 100 parts by weight, and preferably from 5 to 50 parts by weight and most favourable from 10 to 30 parts by weight.

Use of ~~the~~ solvent contributes to lower viscosity of the borate ester of polyoxyalkylene.

As ~~the~~ solvent, there can be used

water, methyl alcohol, ethyl alcohol, isopropyl alcohol, butyl alcohol, isopropyl ether, ether, ethylene glycol, polyethylene glycol, polyethylene dimethyl ester, diethylene glycol, triethylene glycol, ethylene glycol dimethyl ether, diethylene glycol dimethyl ether, diethylene glycol diethyl ether, ethylene glycol dipropyl ether, triethylene glycol monobutyl ether, triethylene glycol monoethyl ether, diethylene glycol diethyl ether, diethylene glycol propyl ether, diethylene glycol dibutyl ether, dimethyl ether, propylene glycol, acetone, methylethyl ketone, furfural, dioxane, methane sulfonate, diethyl ether, tetrahydrofuran, hexane, acetic anhydride, heptane, octane, nonane, decane, undecane, benzene, toluene, xylene, cyclohexane, cyclohexene, dimethyl formamide, dimethyl sulfoxide, hexamethyl triamide phosphate, acetonitrile, N-methyl pyrrolidone, chloroform and carbon tetrachloride and the solvents are used by alone or combination.

The amount of solvent to 100 parts by total weight of borate ester of polyoxyalkylene and amino-group containing compound are from 0 to 100 parts by weight, and preferably from 5 to 50 parts by weight and most favourably from 10 to 30 parts by weight. *preferably* *Ingredients*

The other ingredient other than amino-group containing compound and/or solvent may be incorporated to borate ester of into

Improving

polyoxyalkylene for the purpose of improving the properties of cleaning and purging resin compound of the present invention according to

As the other ingredients, there can be used stabilizer, neutralizer, antioxidant, ultraviolet absorber, light stabilizer, antistatic agent, lubricant, processability improving agent, filler, dispersing agent, coupling agent, anti-copper rusting agent, blowing agent, nuclear deformer, forming agent, anti-forming agent, defomer, colorants, pigment, dyeing agent, carbon black, water tree preventing agent, voltage stabilizer, anti-tracking agent, organic peroxide, crosslinking agent, disinfectant, antiseptics, anti-mold agents and antirust agents.

In the present invention, the resin composition for purging contaminant from a plastic machine processing means the resin composition which is fed from a hopper into the inside vacaney of the plastic processing machine to fill the vacaney with the resin composition.

The vacaney of plastic processing machine had previously been filled with other resin composition for producing the plastic mold or film and the surface of screw barrel and die had become contaminated by coloured sticky contaminant formed by decomposition of the resin.

In case of long time operation or when resin composition changing for producing other sort of plastic article, remained the product's resin composition used for previous product and the contaminant caused by products

long time operation must be purged for new plastic article production to prevent cross-contamination. ^{holder}
~~cross-contamination~~ used

The resin composition for purging ~~contaminants~~ taminant and ~~remained~~ previously used resin composition(s) is fed into plastic processing machine after previous plastic article production is over.

The resin composition for purging may be continuously fed ^{used} into the processing machine after the resin composition is filled the vacancy of the plastic processing machine.

After the resin composition for purging is filled, then switch off the heat source and lower the machine temperature to room temperature and leaves the resin composition ^{remains in the processing machine} for sufficient time such as from 6 to 48 hours to contact with contaminants and residue of previously used resin composition(s).

When the next plastic mold or film will be produced, the new resin composition for next plastic mold or film will be fed into the plastic processing machine, then ^{any} ~~the remained~~ ^{remaining} purge resin composition absorbed ^{having} with contaminant will be exhausted purged.

The resin used for the resin composition of present invention is the thermoplastic resin.

As the thermoplastic resin, there can be used high density polyethylene, high pressure low density polyethylene such as HP-LDPE, EVA, EEA, Ionomer, olefin vinyl alcohol copolymer, LLDPE, VLDPE, polypropylene (PP), polystyrene (PS), polystyrene

styrene copolymer
acrylonitrile-butadiene-styrene copolymer
mer (ABS), acrylonitrile-styrene copolymer
(AS), acrylonitrile-butadiene copolymer,
acrylonitrile acrylate-styrene copolymer,
polyvinyl chloride (PVC), polyamide, poly-
~~methylmethacrylate~~
~~methacrylate~~ (PMMA), polyacetal (POM),
aminopolyacrylamide, polyarylate, fluoro-
carbon resin, polyimide (PI), ~~polyamine-~~
~~bismaleimide~~ (PABI), polyamideimide (PAI),
polyetherimide (PEI), bismaleimidetriazine
resin (BT), polysulfone, polybutylene terephthalate
terephthalate (PBT), polyethylene tereph-
thalate (PET), polyvinylidene chloride,
polycarbonate (PC), polyvinyl acetate,
polyvinyl alcohol, polyvinyl ether,
polyvinyl formate, modified PPE, modifi-
ed polyphenyleneoxide (PPO), polyphenylene
sulfide (PPS), polyethersulfone (PESF),
polyetheretherketone (PEEK), polyarylsulfone
(PAS), ~~polymethylpentene~~ (TPX), liquid
crystal polymer, silicone resin, natural
rubber (NR), butyl rubber (IIR), acrylonitrile-
butadiene rubber (NBR), chloroprene
rubber (CR), styrene butadiene rubber (SBR),
butadiene rubber (BR).

~~The production method of the resin composition for purging away contaminants according to the present invention is not limited to any specific method; however, the following method is desirable.~~

To the 100 parts by weight of a thermoplastic resin, 0.1~10 parts by weight of a borate ester of glycol ether expressed by general formula (1) is added.

The form of the thermoplastic resin may be powder or pellet form.

in
of a

The borate ester of polyoxyalkylenes may be soaked into thermoplastic resin powder or pellet. *the soaking*

~~It~~ The soaking is desirable to conduct at the temperature of over the glass transition point because at the temperature soaking speed is fast.

Another The other production method for ^{compositions} ~~resin composition~~ of the present invention may be conducted as follows.

The thermoplastic resin and borate ester of polyoxyalkylenes are fed ~~so~~ ^{into} a plastic processing machine or bunbury mixer, in which they are blended and extruded ~~from~~ ^{through} ~~a~~ pelletizing die having many ~~hole~~ ^{holes} of 3~7mm diameter.

Each extruded ~~strings~~ ^{String 15} are cut to form ~~pellets~~ ^{pellets} having the length of 3~7mm.

In case the amount of the borate ester of polyoxyalkylenes is less than 0.1 parts by weight, the resin composition for purging does not exhibit the cleaning and purging effect. *If on the other hand the amount of the borate ester of polyoxyalkylene*

EXAMPLE

Now, the resin composition for purging away ~~contaminant~~ ^{contaminants} in the plastic processing machine according to the present invention will be described in further detail with reference to ~~Example~~ ^{specific Examples}.

However, it should be understood that

should

the present invention is by no means restricted by such specific Example. Examples

Example 1

Borate ester of polyoxyalkylene expressed by chemical formula (2) was obtained by following synthesis process.

In a 7000 ml flask equipped with three inlet pipe and displaced by nitrogen gas were charged 146g (1 mole) of triethyl borate [$B(OC_2H_5)_3$], 1.2g of dibutyl tin dilaurate and 50 ml of benzene.

Subsequently, to the solution in the flask was added with 996g (3 mole) of tripropylene glycol triethylenglycol monomethyl ether under stirring conditions to obtain uniform blended solution.

Subsequently, the solution in the flask was stirred for 13 hours at $95^{\circ}C$ under the condition of distillation to remove ethanol and benzene as the byproduct to obtain 1002g (0.99 mole) of a borate ester of polyoxyalkylene expressed by chemical formula (2).

In a vessel, 99.0 parts by weight of a high pressure low density polyethylene (made by Nippon Unicar Company Ltd., melt mass flow rate 1.2g/10 min., density 0.923 g/cm³) and 1.0 parts by weight of borate ester of polyoxyalkylene expressed by chemical formula (2) obtained by above minutes mentioned method were blended for 5 minutes under room temperature to obtain a mixture, then the mixture was thrown into a continuous blending extruder (made

by K. C. K. Company Ltd., machine name K. C. K
80×2-35 VEX type) to produce ~~the~~ resin contaminant
composition for purging away a contaminant
~~as~~ in a pellet form having a length of 3
mm and a diameter of 3mm.

The resin composition was named therafel
~~after~~ purge resin composition (1).

Subsequently, the purging effect ~~value~~
ation test was conducted by following
procedures. Procedure

Dry-blend ^{Adry-blend} was prepared by blending 95
kg of ^a ^{noncolored} low density polyethylene
^{pellets} (made by Toso Company Ltd.,
PETLOSENE 183) with 5kg of ^{color} master
batch (made by Tokyo Ink Company Ltd., PEX
3152, blue ^{colored}). Then the obtained
dry-blend of 100kg were thrown to ^{the} hopper
of the ^{an} extuder having a 65mm diameter
screw. Then the dry-blend were fed into
the extruder to be heat-kneaded.

After 100kg of ^{the} dry-blend were passed
through the extruder, the purge resin
composition (1) for purging away ~~contami-~~
nant of the present invention obtained
by above mentioned method were fed to
the same extruder and passed through ^{the} ~~the~~
~~said~~ ~~purge resin composition (1)~~ till the
residue of above mentioned ^{color} master
batch which were stuck or adhered to the
^{surface} of the screw and barrel were
purged.

This procedure is called as decolouri-
zation.

As the blank test, ^{the} decolourization
test were conducted except that the
resin composition for purging away ~~con-~~
~~contaminants~~

taminant of the present invention was exchanged ~~by~~ ^{for} the non-coloured linear low density polyethylene pellet (made by Toso Company Ltd., FS240A).

Also, comparative purge resin composition I and comparative purge resin composition II were prepared for comparative decolorization test, which were equivalent to the conventional purge resin composition as described in the above "Description of the Related Art" section.

Description

Comparative purge resin composition I

Resin composition consisting 99.0 weight % of high pressure low density polyethylene (made by Nippon Unicar Company Ltd., melt massflow rate 1.2 g/10 min., density 0.923 g/cm³) and 1.0 weight % of poly(9)oxyethylene nonylphenyl ether.

Comparative purge resin composition II

Resin composition consisting 99.0 weight % of high pressure low density polyethylene (made by Nippon Unicar Company Ltd., melt massflow rate 1.2 g/10 min., density 0.923 g/cm³) and 1.0 weight % of poly(II)oxyethylene dodecylether sodium sulfate.

Result of decolorization of purge resin composition (1)

Each purge resin resin composition amount used till decolorization were observed

rved were as follows.

- Purge resin composition (1) of the present invention 22 kg
 - Blank test 280 kg
 - Comparative purge resin composition I 250 kg
 - Comparative purge resin composition II 230 kg
- According to the above result, it was recognized that the purge resin composition (1) was excellent compared to the comparative purge resin compositions because the used amount of purge resin composition (1) was about 10% of the used amount of conventional type purge resin composition resulting to achieve cost and time saving.

Savings

Example 2

Borate ester of polyoxyalkylenes expressed by chemical formula (8) was obtained by following synthesis process.

In a 7000 ml flask equipped with three inlet pipes and displaced by nitrogen gas were charged 146 g (1 mole) of triethyl borate [$B(OC_2H_5)_3$], 1.2 g of dibutyl tin dilaurate and 50 ml of benzene.

Subsequently, to the solution in the flask was added with 756 g (3 mole) of pentylethylene glycol monomethyl ether under stirring conditions to obtain a uniform blended solution.

Subsequently, the solution in the flask was stirred for 13 hours at 95°C under the condition of distillation to

conditions

byproduct

remove ~~of~~ ethanol and benzene as the ~~by~~
~~product~~ ^{and} to obtain 758g (0.99 mole) of a
borate ester of polyoxyalkylene ~~expressed~~
~~seed~~ by chemical formula (8).

In a vessel, 99.0 parts by weight of a high pressure low density polyethylene (made by Nippon Unicar Company Ltd., melt mass flow ^{rate} 1.2g/10 min., density 0.923g/cm³) and 1.0 parts by weight of borate ester of glycol ether expressed by chemical formula (8) obtained by above mentioned method and 1.0 parts by weight of polyoxyethylene (9) lauryl amine were blended for 5 minutes ^{at} room temperature to obtain ^a mixture. Then the ^a mixture was thrown into the ^a continuous-blending-extruder (made by K. C. K. Company Ltd., machine name K. C. K 80×2.35 VEX type) to produce the resin composition for purging away ~~the~~ contaminant ^{as} in a pellet form having a length of 3mm and a diameter of 3mm.

The resin composition was named thereafter ^{hereafter} ~~purge~~ resin composition (2). ^{evaluati}

Subsequently, the purging effect ~~value~~ test was conducted by following procedures. ^{A dry-blend}

Dry-blend was prepared by blending 95 kg of ^{noncolored} low density polyethylene ^{polyethylene} pellet (made by Toso Company Ltd., PETLOSENE 183) with 5kg of color master batch (made by Tokyo Ink Company Ltd., PEX 3152, blue ^{colored}) ^{colored}. Then the obtained dry-blend of 100kg were ^{was} thrown to the hopper of the ^a extuder having a 65mm diameter screw, then the dry-blend were fed into the extruder to be heat-kneaded. ^{was}

After 100kg of dry-blend were passed through the extruder, the purge resin composition (2) for purging away contaminant of the present invention obtained by above mentioned method was fed to the same extruder and passed through the said purge resin composition (2) till the residue of above mentioned colour master batch which were stuck or adhered to the surface of the screw and barrel were purged.

Result of decolorization of purge resin composition (2)

Each purge resin amount used till decolorization were observed were as follows.

- Purge resin composition (2) of the present invention 20 kg
- Blank test 280 kg
- Comparative purge resin composition I 250 kg
- Comparative purge resin composition II 230 kg

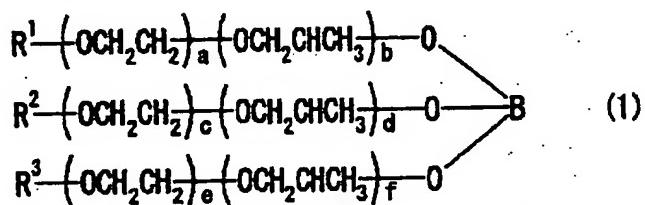
According to the above result, it was recognized that purge resin composition (2) of present invention was excellent compared to the other purge resin, because the used amount of purge resin composition of the present invention was about 10% of the used amount of conventional purge resin composition, resulting to achieve cost and time saving. Dr

WHAT IS CLAIMED IS

1. A resin composition for purging away contaminant in the plastic processing machine comprising

(A) 100 parts by weight of a thermoplastic resin

(B) 0.1-10 parts by weight of a borate ester of polyoxalkylene expressed by the following general formula (1)



wherein R¹, R² and R³ are independently selected from group consisting of hydrogen and hydrocarbon group, a, b, c, d, e and f are positive integers independently from 0 to 30 whose sum is from 6 to 80.

2. A resin composition for purging away contaminant in the plastic processing machine according to claim 1, which further comprising

(C) 0.1-10 parts by weight of an aminogroup containing compound.

3. A purging method of a contaminant in the plastic processing machine by passing the resin composition of claim 1 or 2 through inside of said plastic processing machine.

ABSTRACT

Disclosed is a resin composition for purging away contaminant in the plastic processing machine and a purging method of a contaminant in the plastic processing machine using the resin composition.

The resin composition comprises a thermoplastic resin and borate ester of polyoxyalkylene.